

***The Neurobiology of Learning and Memory 3rd
edition Rudy Test Bank***

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Chapter 2: Memory and the Brain: Central Concepts

Test Bank

Type: true-false

Title: Chapter 2 - Question 1

1. It is generally agreed that the brain works like a warehouse to store items of information.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 2

2. Memory is a result of experience modifying synaptic connections between neurons that are activated by the experience.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 3

3. The ionic composition of the intracellular and extracellular fluids become more alike when the neuron depolarizes.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 4

4. An extracellular electrode used to measure the field potential detects a single depolarizing synapse.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 5

5. When a neuron depolarizes, the composition of the inside of the cell becomes less like that of the extracellular fluid.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 6

6. Glutamate is an excitatory neurotransmitter.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 7

7. Glutamate receptors involved in LTP are found along the axon.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 8

8. Calcium is a second messenger.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 9

9. Second messengers are proteins.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 10

10. Second messengers can be quickly synthesized.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 11

11. Phosphatases add phosphates to other proteins.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 12

12. Ionotropic receptors protrude outside and inside the cell.

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 13

13. Competitive antagonists, such as APV, can replace a ligand and cause conformational changes in the receptor.

- a. True
- *b. False

Type: true-false

Title: Chapter 2 - Question 14

14. AMPA receptors influx mainly Na^+ ; NMDA receptors influx both Na^+ and Ca^{2+} .

- *a. True
- b. False

Type: true-false

Title: Chapter 2 - Question 15

15. Initial change in the strength of synapses depends on post-translational processes; however, enduring changes require new protein (transcription and translation processes).

- *a. True
- b. False

Type: essay/short answer question

Title: Chapter 2 - Question 16

16. Describe the in vitro LTP preparation.

Feedback: It requires dissecting a very thin tissue slice from the hippocampus and sustaining its function by placing the sample in a chemical cocktail. A stimulating electrode is positioned to stimulate axons, and a recording electrode is positioned to record the field potential.

Type: essay/short answer question

Title: Chapter 2 - Question 17

17. Why is the resting membrane potential negative?

Feedback: There are more negatively charged ions inside the neuron.

Type: essay/short answer question

Title: Chapter 2 - Question 18

18. What is LTD?

Feedback: It is the reduction in the field potential produced by a weak, long-lasting inducing stimulus.

Type: essay/short answer question

Title: Chapter 2 - Question 19

19. Describe the simple form of an LTP experiment.

Feedback: The experiment has three stages: 1) A weak stimulus is applied to establish a baseline. 2) Then, a strong inducing stimulus is presented to induce LTP. 3) The weak stimulus is then presented again to determine if the synapses were strengthened.

Type: essay/short answer question

Title: Chapter 2 - Question 20

20. What are the three components of the synapse?

Feedback: 1) Presynaptic component; 2) postsynaptic component; 3) synaptic cleft

Type: essay/short answer question

Title: Chapter 2 - Question 21

21. Where are glutamate receptors found?

Feedback: Along the membrane of dendritic spines

Type: essay/short answer question

Title: Chapter 2 - Question 22

22. What is an excitatory synapse?

Feedback: A synapse with a postsynaptic component that has dendritic spines containing glutamate receptors.

Type: essay/short answer question

Title: Chapter 2 - Question 23

23. What is the composition of the postsynaptic density?

Feedback: It contains several hundred proteins that include glutamate receptors, ion channels, signaling enzymes, scaffolding proteins, and adhesion molecules.

Type: essay/short answer question

Title: Chapter 2 - Question 24

24. Where is the extracellular matrix located?

Feedback: The extracellular space separates the pre- and postsynaptic components of the synapse.

Type: essay/short answer question

Title: Chapter 2 - Question 25

25. What is glutamate?

Feedback: It is the excitatory neurotransmitter that binds to glutamate receptors.

Type: essay/short answer question

Title: Chapter 2 - Question 26

26. Where is the postsynaptic density located?

Feedback: In the area of the postsynaptic spine that receives neurotransmitter.

Type: essay/short answer question

Title: Chapter 2 - Question 27

27. Why is glutamate a first messenger?

Feedback: Because it binds to a cell surface receptor and initiates intracellular activity

Type: essay/short answer question

Title: Chapter 2 - Question 28

28. What are the two types of proteins targeted by second messengers?

Feedback: Kinases and phosphatases

Type: essay/short answer question

Title: Chapter 2 - Question 29

29. What is the function of a kinase?

Feedback: To phosphorylate proteins and change their function

Type: essay/short answer question

Title: Chapter 2 - Question 30

30. What is the structure of a kinase?

Feedback: It has two domains: an inhibitory domain and a catalytic domain.

Type: essay/short answer question

Title: Chapter 2 - Question 31

31. What are the two functions of the postsynaptic density?

Feedback: 1) alignment of glutamate receptors located on the postsynaptic component with the presynaptic neurotransmitter release zone; 2) positioning of other signaling molecules needed to modify synapses near glutamate receptors so that they can be rapidly activated

Type: essay/short answer question

Title: Chapter 2 - Question 32

32. What is the cytosol?

Feedback: Fluid inside the cell

Type: essay/short answer question

Title: Chapter 2 - Question 33

33. What are the functions of phosphorylation?

Feedback: It changes a protein's 1) location, 2) ability to associate with other proteins, and 3) enzymatic activity.

Type: essay/short answer question

Title: Chapter 2 - Question 34

34. Memories evolve in four overlapping stages. What are they?

Feedback: 1) generation; 2) stabilization; 3) consolidation; 4) maintenance

Type: fill-in-blank

Title: Chapter 2 - Question 35

35. The perforant path connects the entorhinal cortex to the _____.

*a. dentate gyrus

Type: fill-in-blank

Title: Chapter 2 - Question 36

36. Hebb referred to "diffuse circuits of connected neurons that develop to represent specific percepts or concepts" as _____.

*a. cell assemblies

Type: fill-in-blank

Title: Chapter 2 - Question 37

37. To induce LTP in CA3 neurons, the stimulating electrode should be placed near the _____.

*a. mossy fibers

Type: fill-in-blank

Title: Chapter 2 - Question 38

38. Synaptic vesicles contain _____.

*a. neurotransmitter

Type: fill-in-blank

Title: Chapter 2 - Question 39

39. When the membrane potential becomes more negative, the neuron is said to be _____.

*a. hyperpolarized

Type: fill-in-blank

Title: Chapter 2 - Question 40

40. Axons projecting from the dentate gyrus to CA3 are called _____.

*a. mossy fibers

Type: fill-in-blank

Title: Chapter 2 - Question 41

41. Shaffer collaterals terminate onto _____.

*a. CA1 neurons

Type: fill-in-blank

Title: Chapter 2 - Question 42

42. The _____ in a typical LTP experiment is the fEPSP.

*a. dependent variable

Type: fill-in-blank

Title: Chapter 2 - Question 43

43. A major feature of the postsynaptic membrane in excitatory synapses is _____.

*a. PSD

Type: fill-in-blank

Title: Chapter 2 - Question 44

44. _____ are protein complexes that transport receptors to and from the plasma membrane.

*a. Endosomes

Type: fill-in-blank

Title: Chapter 2 - Question 45

45. The material that fills the synaptic cleft is called _____.

*a. extracellular matrix

Type: fill-in-blank

Title: Chapter 2 - Question 46

46. Excitatory synapses respond to the neurotransmitter called _____.

*a. glutamate

Type: fill-in-blank

Title: Chapter 2 - Question 47

47. The _____ domain of a kinase adds phosphate groups to other proteins.

*a. catalytic

Type: fill-in-blank

Title: Chapter 2 - Question 48

48. The process of _____ depends on the catalytic unit.

*a. phosphorylation

Type: fill-in-blank

Title: Chapter 2 - Question 49

49. Kinases are put into the active state by _____.

- *a. second messengers

Type: fill-in-blank

Title: Chapter 2 - Question 50

50. As the intensity of a high-frequency inducing stimulus increases, so does the _____ of LTP.

- *a. duration

Type: fill-in-blank

Title: Chapter 2 - Question 51

51. The region of the spine where the membrane is thickened and contains scaffolding proteins and receptors is called the _____.

- *a. PSD

Type: multiple response question

Title: Chapter 2 - Question 52

52. Which statement(s) is/are true? (Select all that apply.)

- *a. Kinases modify other proteins via phosphorylation.
- *b. Kinases are directly activated by first messengers.
- *c. Phosphatases remove phosphates from proteins.
- d. Phosphates phosphorylate second messengers.
- e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 53

53. Which does *not* describe a second messenger? (Select all that apply.)

- *a. It is a type of protein with active and regulatory domains.
- b. It relays signals from receptors to target molecules inside the cell.
- c. It is readily made inside the cell.
- d. It can activate kinases and phosphatases.

Type: multiple response question

Title: Chapter 2 - Question 54

54. Which statement(s) is/are true? (Select all that apply.)

- a. The flow of information through the trisynaptic circuit begins at CA3.
- b. The perforant path connects CA3 to CA1
- c. Mossy fibers connect the dentate gyrus to CA1
- *d. Shaffer collateral fibers connect CA3 connects to CA1
- e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 55

55. Where would you place the extracellular recording electrode to measure the field potential if you stimulated mossy fibers? (Select all that apply.)

- a. In the dentate gyrus region
- b. In the CA1 region
- *c. In the CA3 region
- d. In the entorhinal cortex
- e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 56

56. Which statement(s) about intracellular space is/are true? (Select all that apply.)

- *a. Depolarization makes the intracellular space more positive and drives the neuron towards generating action potentials.
- b. Hyperpolarization makes the intracellular space more positive and drives the neuron toward generating action potentials.
- c. When the neuron hyperpolarizes, the intracellular fluid becomes more similar to the extracellular fluid.
- d. Depolarization makes the intracellular space more negative and drives the neuron toward generating action potentials.
- e. None of the above.

Type: multiple response question

Title: Chapter 2 - Question 57

57. The field excitatory postsynaptic potential measures the _____. (Select all that apply.)
- a. release of neurotransmitter from the postsynaptic neuron
 - b. flow of negatively charged ions out of the neuron
 - c. flow of positively charged ions into the neuron
 - d. flow of positively charged ions into the extracellular space
 - *e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 58

58. The extracellular recording directly measures _____. (Select all that apply.)
- a. the flow of positive ions into the neuron
 - b. the flow of negative ions out of the neuron
 - *c. positive ions leaving the field surrounding the electrode
 - d. positive ions leaving the neuron
 - e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 60

60. Which statement(s) is/are true? (Select all that apply.)
- a. The warehouse view memory is generally accepted.
 - *b. Hebb's cell assembly view of memory is generally accepted.
 - c. When one cell (A) participates in firing another cell (B), the ease with which A can fire B will decrease.
 - *d. Memories are stored in many brain regions.
 - e. None of the above

Type: multiple response question

Title: Chapter 2 - Question 61

61. When a neuron hyperpolarizes, the _____. (Select all that apply.)
- *a. intracellular fluid becomes more negatively charged
 - b. likelihood of an action potential increases
 - *c. likelihood of an action potential decreases
 - d. membrane potential becomes more positive
 - e. neuron is damaged

Type: multiple response question

Title: Chapter 2 - Question 62

62. Which statement(s) is/are true? (Select all that apply.)
- *a. Glutamate is a first messenger
 - b. The inhibitory unit of kinases phosphorylates proteins
 - *c. Second messengers change the state of kinases from inactive to active.
 - d. Second messengers are proteins
 - *e. Second messengers target phosphatases

Type: multiple response question

Title: Chapter 2 - Question 63

63. Which statement(s) describe(s) a second messengers? (Select all that apply.)

- a. They are proteins with active and inhibitory domains.
- *b. They relay signals from receptors on the plasma membrane to target molecules inside the cell.
- *c. They activate kinases and phosphatases.
- d. They counteract the impact of first messengers.
- *e. They amplify the impact of first messengers.

Type: multiple response question

Title: Chapter 2 - Question 64

64. Which statement(s) is/are correct? (Select all that apply.)

- *a. Translation requires the presence of mRNA
- *b. Post-translation processes modify existing protein
- *c. The activation of a kinase would be an example of a post-translation modification.
- d. Kinases activate second messengers
- e. None of the above.

Type: multiple response question

Title: Chapter 2 - Question 65

65. Which statement(s) is/are true? (Select all that apply.)

- a. The space between the presynaptic and postsynaptic neuron is empty.
- b. The extracellular matrix resides in the postsynaptic neuron.
- *c. Receptors and scaffolding proteins are located in the post synaptic density.
- d. When the post-synaptic neuron depolarizes positive ions enter the cell.
- *e. When the post-synaptic neuron depolarizes negative ions enter the cell.

Type: multiple response question

Title: Chapter 2 - Question 66

66. Which statement(s) about an LTP experiment is/are *false*? (Select all that apply.)

- *a. The independent variable is the intensity of the electrode.
- b. The dependent variable is the fEPSP.
- *c. The inducing stimulus is used to establish a baseline.
- d. The test stimulus is set to about 35–50% of maximal response.
- e. None of the above